Installation and User's Manual
RAPTAIR60 Diesel Driven Compressor

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VMAC – *Vehicle Mounted Air Compressors*
Toll Free: 1-800-738-8622 Local: 1-250-740-3200
Fax: 1-250-740-3201

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RAPTAIR60 Diesel Driven Compressor System

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Notice: Manuals and products are subject to change without notice

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Important Information

The information in this manual is intended for certified VMAC installers who have been trained in installation procedures and for people with mechanical trade certification who have the tools and equipment to properly and safely perform the installation. Do not attempt this installation if you do not have the appropriate mechanical training, knowledge and experience.

Follow all safety precautions for mechanical work. If you have difficulty with the installation, contact VMAC.

The VMAC warranty form is located at the back of this manual. This warranty form must be completed and mailed or faxed to VMAC at the time of installation for any subsequent warranty claim to be considered valid.

To order parts, contact your VMAC dealer. Your dealer will ask for the VMAC serial number, part number, description and quantity. To locate your nearest dealer, call 1-800-738-8622.

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VMAC – ***Vehicle Mounted Air Compressors***
Toll Free: 1-800-738-8622 Local: 1-250-740-3200
Fax: 1-250-740-3201

1.0 General Information

1.1 Foreword

Read this manual before beginning the installation so that you can understand the requirements. This will help ensure the successful installation and proper operation of the RAPTAIR60.

This manual provides maintenance, repair and troubleshooting instructions for the RAPTAIR60 air compressor system. Proper and regular servicing provides continued high performance and long life. For more information contact VMAC.

KEEP THIS MANUAL WITH THE RAPTAIR60 UNIT FOR USER REFERENCE

1.2 Warranty Registration

The VMAC warranty form is located at the back of this manual. This warranty form must be completed and mailed or faxed to VMAC at the time of installation for any subsequent warranty claim to be considered valid.

1.3 Important Safety Notice

The information contained in this manual is based on sound engineering principles, research, extensive field experience and technical information. Information is constantly changing with the addition of new models, assemblies and service techniques. If a discrepancy is noted in this service manual, contact VMAC prior to initiating or proceeding with service. Current information may clarify the issue. Any person with knowledge of such discrepancies who performs service and repair assumes all risks.

Only proven service procedures are recommended. Anyone who departs from the specific instructions provided in this manual must first assure that their safety and that of others is not being compromised and that there will be no adverse effects on performance or the operational safety of the equipment.

VMAC will not be held responsible for any liability, injuries, loss or damage to individuals or to equipment as a result of the failure of any person to properly adhere to the procedures set out in this manual or standard safety practices. Safety should be your first consideration in performing service operations. If you have any questions concerning the procedures in this manual or require any more information on details that are not included in this manual, please contact VMAC before beginning repairs.

1.4 Safety Messages

This symbol is used to call your attention to instructions concerning your personal safety. Watch for this symbol; it points out important safety precautions, it means, “Attention, become alert! Your personal safety is involved”. Read the message that follows and be alert to the possibility of personal injury or death. Be alert; your safety is involved. While it is impossible to warn about every conceivable hazard, let good common sense be your guide.

This symbol is used to call your attention to instructions on a specific procedure that if not followed may damage or reduce the useful life of the compressor.

This symbol is used to call your attention to additional instructions or special emphasis on a specific procedure.

1.4.1 Safety Precautions

Read this information before operating the compressor for the first time. Follow the information and procedures in this manual for operation, maintenance and repair. Observe the following items to reduce the chance of personal injury or equipment damage.

Follow all safety precautions for mechanical work. Moving fan belts and fan blades are an extreme hazard. Stay clear of all moving parts when the system is operating. Only qualified personnel should perform maintenance and repair on system components and only while the system is properly shut down.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the equipment. Always use genuine VMAC replacement parts; do not use any substitutes.
The procedures described in this service manual are effective methods of service and repair. Some procedures may require the use of tools specially designed for a specific purpose. Anyone using a replacement part, service procedure or tool must first determine that neither their safety nor the safe operation of the equipment will be compromised by the replacement part, service procedure or tool selected.

This manual contains various warnings, cautions and notices that must be observed to reduce the risk of personal injury during service or repair and the possibility that improper service or repair may damage the equipment or render it unsafe. *Be aware that it is impossible to warn of all the possible hazardous consequences that might result from failure to follow these instructions.*

1.4.2 Fire and Explosion Hazards

Fire in the compressor can cause an explosion and flame projection. Should this occur, there is potential for serious injury or death.

Vaporized oil propelled by high-pressure air is an explosive mixture.

You must observe the following when operating the compressor:

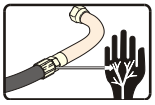
- Constant vigilance is necessary around high-energy equipment
- Be attentive for unexplained changes in operation parameters and record any changes
- Never bypass or disable the temperature sensors
- Never expose the tank or compressor to extreme heat
- Ensure that the air entering the compressor is free of flammable vapors

1.4.3 Personal Hazards

Follow all safe work practices. Wear the appropriate safety equipment.

Do not breathe the compressor air. Vaporized oil is a respiratory hazard.

Always use the appropriate personal protective equipment, particularly eye and hearing protection when operating air-powered equipment.



The compressor system is under sufficient pressure that a leak could force the air/oil mixture through the skin directly into your bloodstream. This could cause serious injury or death.

Never adjust or attempt to make any repairs to the compressor system while the engine is running. Components and hoses under pressure could fail and cause serious injury or death.

Never perform maintenance procedures on the system until the compressor has been shut down for at least 5 minutes to ensure the system is fully depressurized. After 5 minutes open the discharge valve to ensure the system is depressurized. Failure to depressurize the system could cause parts to separate explosively. Flying parts could cause serious injury or death. Air/oil mixture could be sprayed out with sufficient force to penetrate the skin, which could cause serious injury or death.

The compressor and the compressor system get very hot during operation, contact with the components or the oil can cause serious burns. Allow sufficient time for the system to cool before performing service.

Components and hoses under pressure could separate suddenly, fly out and cause serious injury or death. If equipped, the auxiliary air tank must be drained before servicing any components in the compressor system.

1.4.4 Pressure regulator and/or lubricator

The compressor can produce air pressures up to approximately 150 PSI (1030 kPa). It is the responsibility of the user to know the pressure and air flow requirements of the tools powered by the air compressor system. An appropriate air pressure regulator and lubricator can be externally installed to the outside of the pressure supply valve. Failure to regulate the air pressure may cause damage to the tool.

1.5 Specifications and Components

This is a flooded-lobe, rotary screw compressor (filled with VMAC certified and approved synthetic oil) driven by a diesel motor. Compression occurs when inlet air (at normal atmospheric pressure) enters a chamber where it is trapped between the rotating rotor lobes. A lubricated pitch line provides sealing. As the lobes mesh, they reduce the volume of the air, compressing it to the desired pressure.

The system has a two-stage air/oil separator. The first separation stage consists of baffles, which perform mechanical separation. The second stage uses a special separation element, which delivers dry air to the outlet. The second stage is a spin-on type coalescing filter.

Pressure regulation is achieved with an electro-mechanical inlet valve settable through the Display box.

The system pressure is pre-set at 150 psi. To reduce the pressure, refer to section 7.4.6, and use a Filter Regulator Lubricator (FRL) to set the final tool pressure.

The compressor is protected by a paper-type replaceable air filter and a spin-on type oil filter.

Safety features include:

- 200 PSI relief valve in separation manifold
- blow-down valve to discharge system pressure on shutdown
- temperature safety sensor in compressor oil, separation manifold and engine coolant

Do not disable or bypass the over-temperature shutdown circuits. Failure of the shutdown system could result in equipment damage, injury or death.

A liquid-to-air cooler with thermostatic valve maintains operating temperatures in an optimal performance range which increases system durability and reduces the temperature of the compressed air.

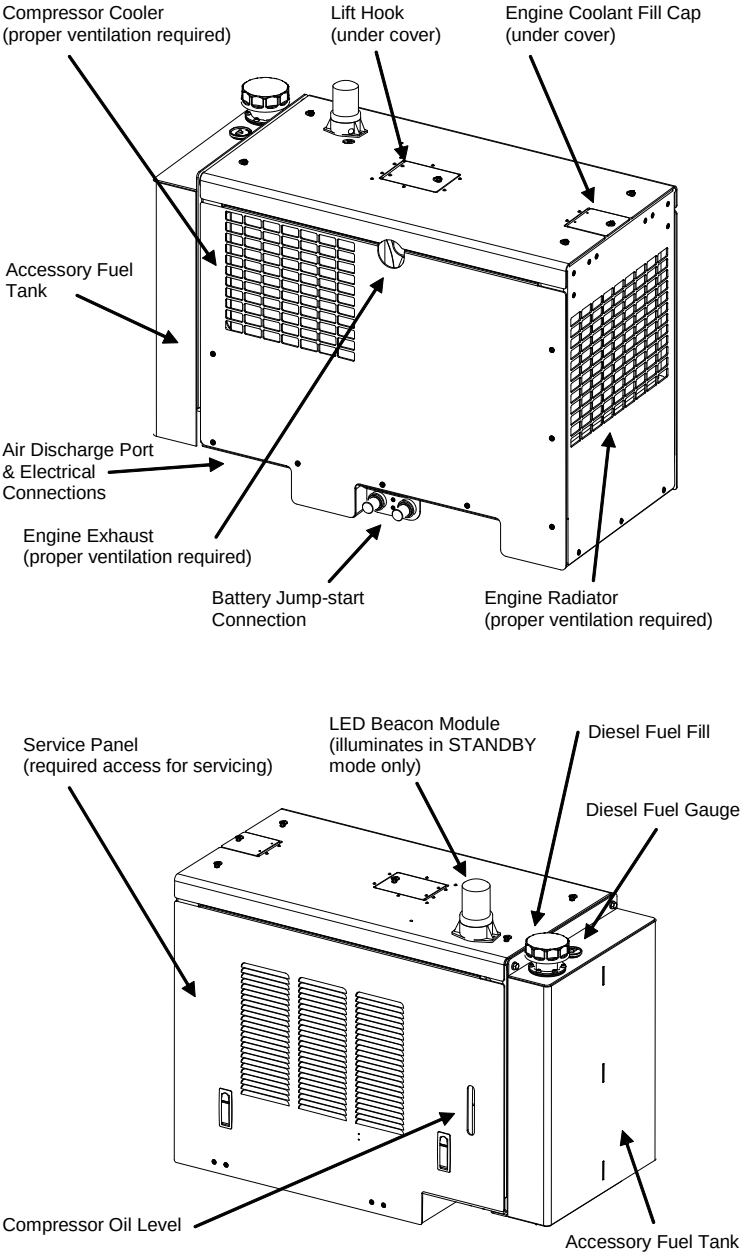


Figure 1.1 - System components

2.0 Installation Requirements

The information in this section is very important for proper operation of the compressor. Read these requirements before beginning installation.

Before installing the RAPTAIR60, examine the possible locations and consider the following factors when selecting a location:

- Hose lengths will be the shortest possible and a minimum number of 90 degree fittings will be used
- Oil level at the sight glass can be checked easily
- Sufficient clearance around the unit for good air circulation and effective cooling
- Can it be serviced easily without having to disconnect lines or remove and reposition the unit (service panel is accessible and can be removed)?
- Protected from excessive exposure to the elements and possible incidental damage from other operations
- Away from heat sources such as engines, exhaust systems or other components that generate heat
- Not in a location where it will be exposed to high contamination levels, including combustible gases
- Exhaust can be routed away from coolers to open air and not orientated in a way that it will fill up with rain (or exhaust flapper installed).

2.1 Air Receiver Requirements

A reservoir tank is recommended.

The RAPTAIR60 unloads the air pressure in the system, which minimizes fuel burn, equipment wear, enclosure temperature and noise, when compressed air is not being used.

If the plumbing downstream from the RAPTAIR60 is tight (has no leaks), a 5 gallon air receiver is adequate. If you use an auxiliary air tank with this system, the line to the auxiliary tank must be installed as high as possible (not in the bottom of the tank) to prevent water from clogging the line (Figure 2.1 -Auxiliary tank connection). Failure to observe these requirements will result in damage to the system.

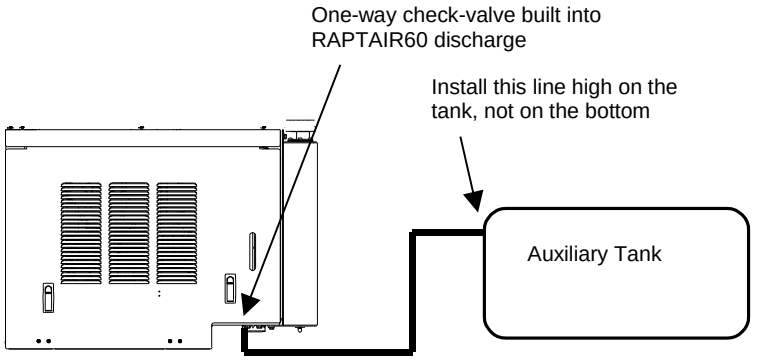


Figure 2.1 -Auxiliary tank connection

A one-way check valve is built into the RAPTAIR60 tank. Do not install an additional check valve as this may cause undesirable operation.

2.2 Ventilation Requirements

During operation, the RAPTAIR60 can develop considerable heat, as much as a house furnace.

Proper ventilation is vital for proper operation and to avoid damage to components.

If you are installing the RAPTAIR60 into a new configuration, refer to section 5.3 for testing ventilation information.

Ensure there is a minimum of 6" (150mm) clearance between cooler grills on diesel drive units and any other components mounted on the vehicle. Also ensure there is a good supply of cool air to the bottom openings, and the service panel side of the unit, and good exhaust from the cooler and radiator sides. Direct the diesel exhaust to vent to atmosphere and in a safe location.

The engine radiator and compressor cooler fans push hot air from the unit. Cold air is drawn in around the bottom of the unit and through the louvers on the service panel.

2.2.1 Top Mounting

This is the preferred mounting location. Placing the unit on top of the service body (Figure 2.2 -Mounting locations) provides the best access to ambient air and provides the best cooling. Maintain a minimum of 6” between the sides of the compressor housing and all other solid objects

2.2.2 Enclosed Mounting

Enclosed mounting is not recommended for most applications due to the significant heat generated.

With the bottom openings being used as a cool-air supply, ensure no hot air from the engine and/or compressor is recirculated into the bottom section when mounted in an enclosed space.

It may be necessary to block-off the bottom openings on the compressor cooler side if mounted in an enclosed space to prevent recirculation,

Mounting the RAPTAIR60 in an enclosure (Figure 2.2 -Mounting locations) will limit access to ambient air, restrict the escape of hot air from around the unit and have an adverse effect on cooling. Make sure that adequate ventilation is provided so the cooling system will function properly (i.e. a pull-out drawer).

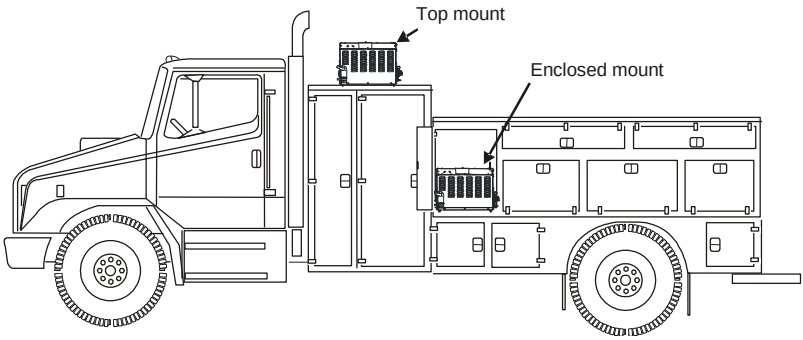


Figure 2.2 -Mounting locations

It is not possible to make absolute recommendations regarding ventilation because of the widely differing circumstances that are

possible. Duty cycle, ambient temperature and enclosure shape are some of the important variables.

Ideal ventilation will provide good airflow through the unit with no restrictions. Cool ambient air ducted to the cooler and installing an exhaust fan to remove hot air is recommended.

Ensure exhaust from the diesel engine is routed in a way to prevent recirculation back into the unit.

3.0 Installing the RAPTAIR60

3.1 Mounting the Diesel Drive Compressor System

☐ Locate a suitable mounting position for the RAPTAIR60. Place the unit and check for clearances to any other objects.

☐ Determine four suitable mounting bolt locations. Holes can be drilled through the bottom of the two rectangular tubes in the frame. Mark four holes on truck and bottom of the tubes. These will be used to secure the unit.

☐ Drill four holes and secure the RAPTAIR60 to the truck. Use a minimum of 4 (2 in each tube) 1/2" (12 mm) bolts. Use bolts, washers and locknuts or Loctite.

☐ Remove the #12 cap from the air outlet, found on the non-service side of the unit under the fuel tank (if installed) and compressor cooler. Connect to the air delivery system.

3.1.1 Optional Fuel tank installation

☐ The fuel tank will be installed on the rear (right hand side of the service panel) of the RAPTAIR60 using four existing mount bolts and one supplied bolt.

☐ Remove the two M8 flange head bolts on the rear upper left and right hand corners

☐ Loosen, but do not remove the two lower vertical separator tank mount bolts. You will need approximately ¼" to slide the fuel tank into place.

☐ Slide the fuel tank into place. Fasten with previously removed and supplied fasteners. Note the supplied M8 flange head bolt will be installed from the bottom up, with the supplied M8 flange head nut on the inside of the RAPTAIR60.

☐ Connect supply and return fuel lines from the RAPTAIR60 to the fuel tank using supplied hose clamps. The supply line is 5/16" and the return line is 3/16"

☐ Connect the fuel level sensor to the RAPTAIR60 harness.

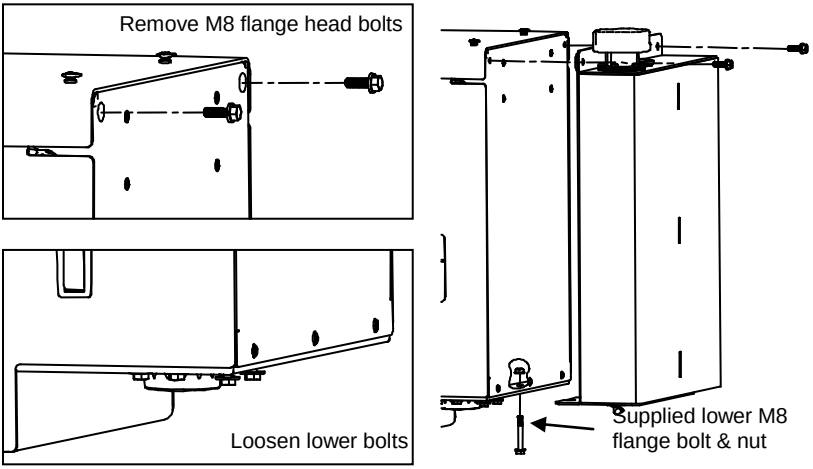


Figure 3.2

3.1.2 Alternate diesel fuel supply

Always adhere to all relevant regulations when connecting to the vehicle's fuel system.

☐ If a larger fuel capacity is desired, an alternate supply can be used, such as the truck fuel supply (when a diesel truck is used).

☐ Connect supply and return fuel lines from the diesel drive to an auxiliary tank. The supply line is 5/16" and the return line is 3/16".

If the auxiliary fuel tank is located below the diesel drive unit a fuel priming pump is required in the supply line.

When plumbing into a truck diesel supply, avoid connecting the RAPTAIR60 fuel supply to the lowest point of the truck tank.

3.1.3 Exhaust options

It is required that the installer supply an adequate exhaust pipe to suit the needs of their application. The muffler is supplied with a 1-5/8" ID outlet.

When installing an exhaust pipe the following steps are to be followed:

☐ Remove the rear service panel.

☐ Connect a suitable 1-5/8" exhaust pipe with an exhaust clamp.

☐ Ensure that if the exhaust is pointing upwards there is a suitable flapper/cover to prevent water from entering the exhaust system.

☐ Ensure the exhaust pipe has suitable clearance and does not come in contact with anything.

4.0 Electrical Connections

There are five main electrical connections to the RAPTAIR60:

- LED Beacon Module Connection
- Display Panel Assembly - Key Switch and Display Box
- Remote Start Wire
- Battery Jump Start Connection
- Cold Climate kit – 110VAC Cold Climate Kit Heater Connection

4.1 LED Beacon Module Connection

Installing the LED beacon module is required.

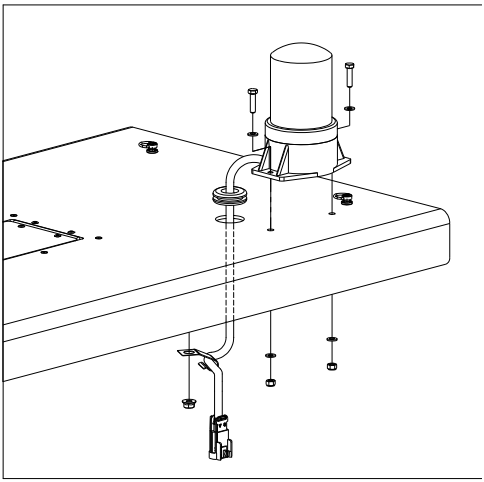


Figure 4.1 – LED beacon module installation

☐ Open the service panel and remove the top panel.

☐ Fasten the LED beacon module with the supplied hardware to the top panel and pass the connector through the 1-1/8in hole and seal with the supplied grommet.

☐ Use the supplied p-clip to orientate the connector towards the service panel for future easy remove, if required.

☐ Re-install the top service panel.

☐ Connect the LED beacon connector to the mating connector just above the coolant overflow bottle.

The beacon module will illuminate in STANDBY mode to inform the operator that the RAPTAIR60 is able to restart when air-use is detected.

If an alternate location of the LED beacon module is desired, splicing and extending the beacon wiring before the connector should be done.

4.2 Display Panel Assembly Connections

To fully utilize the features of the RAPTAIR60, the display panel with the key switch and display box should be mounted in a convenient location for the operator.

Mount the Display Panel inside the cab or a cabinet protected from extreme weather. The Display box is splash-proof, but not fully sealed. Ensure that it will not get kicked or hit by tools and equipment.

There are separate connectors for the Display box cable and the key switch in the same location as the "Air Discharge Port" (see fig. 1). Pigtails have been provided with blunt cut wires for installer connection at the RAPTAIR60 and the Display Panel. The table below has recommended wire sizes for a typical installation. The size may need to be increased for long distance routings between the two components to avoid excessive voltage drops.

Display Panel Wire Description	Suggested Gauge
Display box connections (4 terminal connector)	18AWG
Key Switch – Supply Power – Red wire	14AWG
Key Switch – Return Power – Orange wire	14AWG
Key Switch – Run key – Yellow wire	18AWG

4.3 Remote Start Wiring

The RAPTAIR60 has the ability to remotely start with a single wire interface to the Control Box. A blunt-cut yellow wire is located near the Control Box. With the key-switch in the RUN position, grounding the wire will enable the compressor system. Once the ground is interrupted, the control system will stop the engine.

Use a SPST (Single Pole Single Throw) switch, one terminal connected to the yellow remote-start wire and the other to the ground on the RAPTAIR60.

4.4 Battery Jump Start Connection

The battery jump connection can be used as a temporary boost connection or a permanent cable connection to additional batteries.

Cold weather operation requires the use of an external battery

To permanently connect cables to the Battery Jump Start Connection, unscrew the hex-shaped jump-start lugs. This will expose a threaded post where external battery cables may be connected.

4.5 Cold Climate Version

The 110VAC Cold Climate heaters are used to warm the engine and compressor system in cold weather conditions. A minimum 700W power inverter is required for heater usage or connected to external AC power prior to starting. Heaters should be run for 90 minutes prior to starting the system in cold conditions (time will vary depending on ambient temperature).

In cold weather the RAPTAIR60 needs to be connected permanently to the vehicle's battery (internal battery is not sufficient in extreme cold weather). Use the battery jump connection to permanently connect to vehicle power. The diesel drive will charge the vehicle batteries while running.

See Kubota engine manual for engine oil and fuel recommendations for cold climate operation.

5.0 Completing the Installation

5.1 Before Operation Checklist

Make sure that the following have been completed before operating the RAPTAIR60 for the first time:

☐ Check the compressor oil level. The compressor has been filled to the correct level prior to shipping. Note that the oil is very clear and it is difficult to see the level.

☐ Check the engine coolant level

☐ Check the engine oil level

☐ Check fuel level

☐ Do a final inspection to make sure that all fasteners and connections are tight.

☐ Check that all hoses and wiring are secure and protected.

5.2 Setup, Performance Testing and Adjustments

This system has been adjusted at the factory for general operation. If your tests indicate that adjustment is necessary, refer to section 7.4.6 for specific instructions on how to adjust the system.

You can test the system operation using the tools that will be operated by the system or you can test operation using an orifice (Figure 5.1) to simulate tool use. Use a 0.176" (drill size #16) orifice to test 60 CFM.

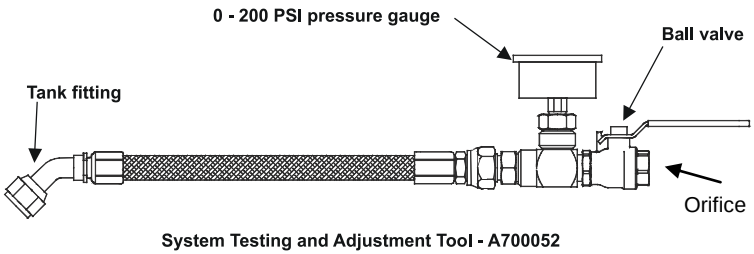


Figure 5.1 -Test Tool

☐ Install the test tool in the air reservoir tank outlet fitting.

Make sure there are no leaks in the test tool. A reservoir tank is recommended. The system may not idle down or unload without a small reservoir of air if there are leaks in the lines or fittings.

Note that hose reels, etc. should be temporarily disconnected and the test tool connected directly to the outlet of the reservoir tank. Long and/or undersized air lines will result in loss of performance.

☐ Make sure that the ball valve is closed.

☐ Enable the compressor system and allow the engine to run until it is at operating temperature.

☐ Operate the air compressor system until the oil is warm.

☐ Observe the pressure gauge. Pressure should be approximately 150 psi (factory setting).

☐ Slowly open the ball valve on the test tool and observe the operation. The engine should idle up when the pressure drops to 130 psi (20psi below system pressure).

☐ With the ball valve fully open, the pressure should stabilize at approx.. 100psi.

☐ Close the ball valve to allow the system pressure to rise. When the control system does not sense air use for a few seconds, it will idle down the engine. If the control system does not detect air use for about 2 minutes, the system will go into UNLOAD mode. If no air is used after approximately another 5 minutes, the engine will shut down.

☐ Open the ball valve to dump air and restart the engine automatically.

5.3 Testing Ventilation

It is best to test the installation while in the hottest expected ambient temperature.

☐ Setup and run the system as per steps 1-4 in section 5.2.

☐ Record the Engine and Compressor Temperatures, and the current ambient temperature for future reference. (Refer to section 7.4.5 to access this information on the Display Box).

☐ Run the system at approx. 100psi for at least one (1) hour with a tool or the Test Tool in Fig. 4.

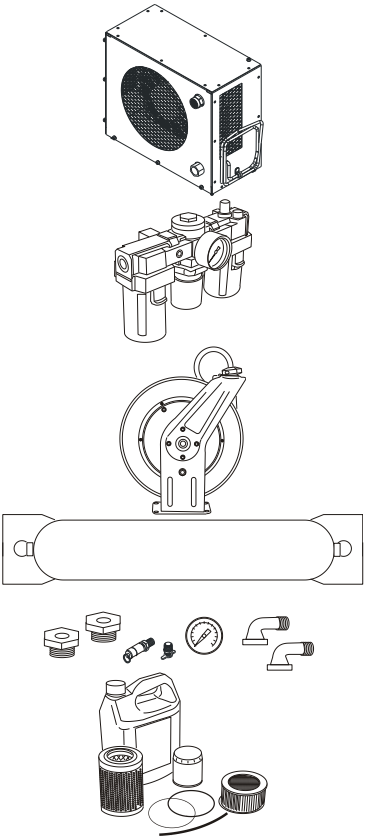
☐ Record the Engine and Compressor Temperatures every 10 minutes.

☐ If after one (1) hour the temperatures haven't stabilized, continue running the system until they do.

☐ If the system Over-temps, then there isn't sufficient ventilation. Review the installation, make changes as needed, and repeat the test.

6.0 Accessory Products from VMAC

To order parts, contact your nearest VMAC dealer or contact VMAC directly at 250.740.3200 or 1.800.738.8622. Have the system serial number, a description of the part and the quantity. The following accessories are also available from VMAC.



Eliminator Aftercooler

Removes up to 80% of moisture from compressed air. Quick installation, automatic drain and compact design

Filter Regulator Lubricator

Removes lubricants, water and dirt from the air stream. Adds atomized tool oil to lubricate tools. Reduces pressure for longer tool life.

Hose Reel

Secure, compact, retractable hose storage in a sturdy reel.

Air Receiver Tank

Thirty-five gallon capacity in a compact tank, complete with fittings and a gauge.

Service Kits

Using OEM service products will extend the life of your system. Includes oil, filters, seals and O-rings. 500 hour/6 month and 1000 hour/12 month service interval kits are available

7.0 Operating the RAPTAIR60

7.1 Control System Features

- ☐ Starting the control system with the Display box, key switch or remote wire
- ☐ Stopping the control system with the Display box, key switch or remote wire
- ☐ Automatic engine shutdown if no air use is detected
- ☐ Automatic engine restart when air-use is detected
- ☐ Multiple adjustable system parameters for delays, pressures and restart options.
- ☐ Monitoring the compressor, engine coolant and manifold temperature probe connection and temperature range
- ☐ Monitoring air pressure sensor connection and over pressure
- ☐ Detection of engine under-speed, over-speed, running when not expected, no tach signal, starting error and low oil level
- ☐ Monitoring low battery voltage
- ☐ Low fuel level warning
- ☐ Air filter restriction warning
- ☐ Error and warning message logging (data-logging)
- ☐ Operator Compressor Servicing reminders (500 and 1000 hours)
- ☐ Buzzer module to warn before engine start
- ☐ LED beacon module to identify when the unit is able to restart
- ☐ Hour meter

7.2 Control System Operation

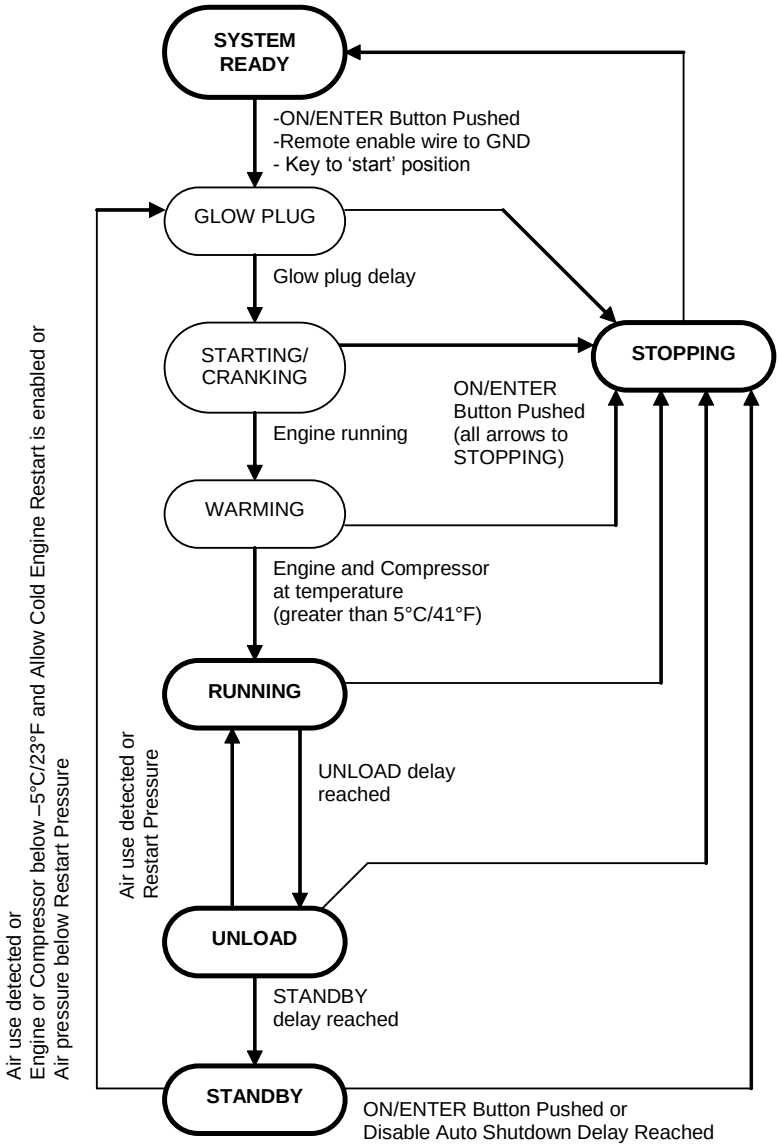

SYSTEM READY
-ON/ENTER Button Pushed
-Remote enable wire to GND
- Key to 'start' position
GLOW PLUG
Glow plug delay
STARTING/ CRANKING
STOPPING
ON/ENTER Button Pushed (all arrows to STOPPING)
Engine running
WARMING
Engine and Compressor at temperature (greater than 5°C/41°F)
RUNNING
UNLOAD delay reached
Air use detected or Restart Pressure
UNLOAD
STANDBY delay reached
STANDBY
ON/ENTER Button Pushed or Disable Auto Shutdown Delay Reached
Air use detected or Engine or Compressor below –5°C/23°F and Allow Cold Engine Restart is enabled or Air pressure below Restart Pressure

Figure 6 – Control System Flow Diagram

7.2.1 Control System Terminology

System State: SYSTEM READY

Compressor system is ready for operation and awaiting a start request. A start request can be made by:

- ☐ Pressing ON/ENTER from the Display Box
- ☐ Turning the key to the START position
- ☐ Grounding the Remote Start wire

System State: GLOW PLUG

Sets the initial delay for the glow plugs based on engine temperature (1 to 15 seconds).

The engine restart buzzer is enabled for 3 seconds then paused for 3 seconds before going into the next state to crank the engine. The glow plugs are enabled during the buzzer cycle and during engine cranking.

Temperature	Glow Plug Delay
Less than 20°C/68°F	15 seconds
Between 20°C/68°F and 40°C/104°F	Linear extrapolation from 15 seconds to 1 second
Greater than 40°C/104°F	1 second

System State: STARTING

The control system will attempt to start the engine.

The control system will allow the engine to attempt to start for 20 seconds. If the engine fails to start the control system will flag a starting error to the Display Box.

System State: WARMING

The control system will wait until the engine and compressor temperatures are above 5°C/41°F before loading the compressor system and going to the RUNNING state.

System State: RUNNING

When using an air tool, the control system should be in the RUNNING state.

At system pressure, the engine speed will decrease to about 2400RPM. If an air tool is used and the pressure drops 20PSI below system pressure, the engine speed will increase to about 3600RPM to build pressure.

If the air pressure stays above System Pressure minus Top-up Pressure, the Delay to-Unload timer will start counting down.

Once the timer reaches the delay time, the system will switch to the UNLOAD state.

If air pressure drops below System Pressure minus Top-up Pressure, the system will reset the Delay to Unload timer.

System State: UNLOAD

In UNLOAD mode, the control system will unload the compressor system but keep the engine running at about 2400RPM. This will extend the compressor system life, reduce engine fuel consumption and reduce engine noise.

To return to the RUNNING state, the control system calculates the air use rate of the air tool (PSI/second).

If the air use rate is above a preset value (HIGH AIR USE RATE) the system will detect that an air tool is used and will switch states.

The system will also return to the RUNNING state if pressure is below the Restart Pressure.

If the system continues to not detect air use, it will continue to count down the delay to STANDBY timer.

If the Delay To STANDBY timer has finished counting down, the system will go to STANDBY mode.

System State: STANDBY

In STANDBY mode, the control system will shut down the engine as it has detected no further air use. The control system is still operating and able to restart with air-use. The LED beacon module is enabled to identify that the engine is able to restart.

When the LED beacon module is illuminated, the system (and engine) is able to restart when air-use is detected.

As with UNLOAD mode, to return to RUNNING mode the operator needs to dump air greater than the preset air rate values, this will restart the engine.

The system will also return to the RUNNING state if pressure is below the Restart Pressure.

If Allow Cold Engine Restart is enabled the engine will restart when it detects engine or compressor temperature is below –5°C/23°F. As with many settings, this can be disabled through the Control Box.

The Disable Auto Restart Delay setting will prevent the system from restarting the engine after a preset time once in the STANDBY state. This prevents the engine from restarting accidentally if left unattended.

System State: STOPPING

When the control system is running and the ON/ENTER button on the Display Box is pressed, the control system will enter the STOPPING state.

The stop solenoid will engage for 10 seconds to allow the engine to shutdown and an additional 10-second delay to blowdown all internal pressure from the system.

After the stopping sequence has finished, the system will revert back to the READY state.

7.3 Starting and Stopping the RAPTAIR60

7.3.1 Starting the System

- ☐ Check the oil level in the tank
- ☐ Check for any fluid leaks around the unit
- ☐ Ensure pneumatic equipment is securely connected and discharge valve is closed
- ☐ Turn the key switch to the RUN position
- ☐ Wait for the Display Box to finish going through the System Check. If there are no errors, the system will be in System Ready state
- ☐ Turn the key to the START position, hold for about 1 second then release or press the ON/ENTER button
- ☐ Display box should go into Glow Plug mode for 1 to 15 seconds then Starting mode where the engine will crank
- ☐ Once engine speed is stable, system will enter System Running mode and is ready for use

7.3.2 Stopping the System

- ☐ Press the Display box ON/ENTER button to stop the system
- ☐ The system will go into STOPPING mode for about 25 seconds
- ☐ Turn the key to the OFF position to fully power-off all electronics

NOTE ***The key-switch can be used to shut down the system also. However, this will directly turn off power to the control system, and the system will have to go through its system check before being able to be restarted.***

7.4 Display Box Messages

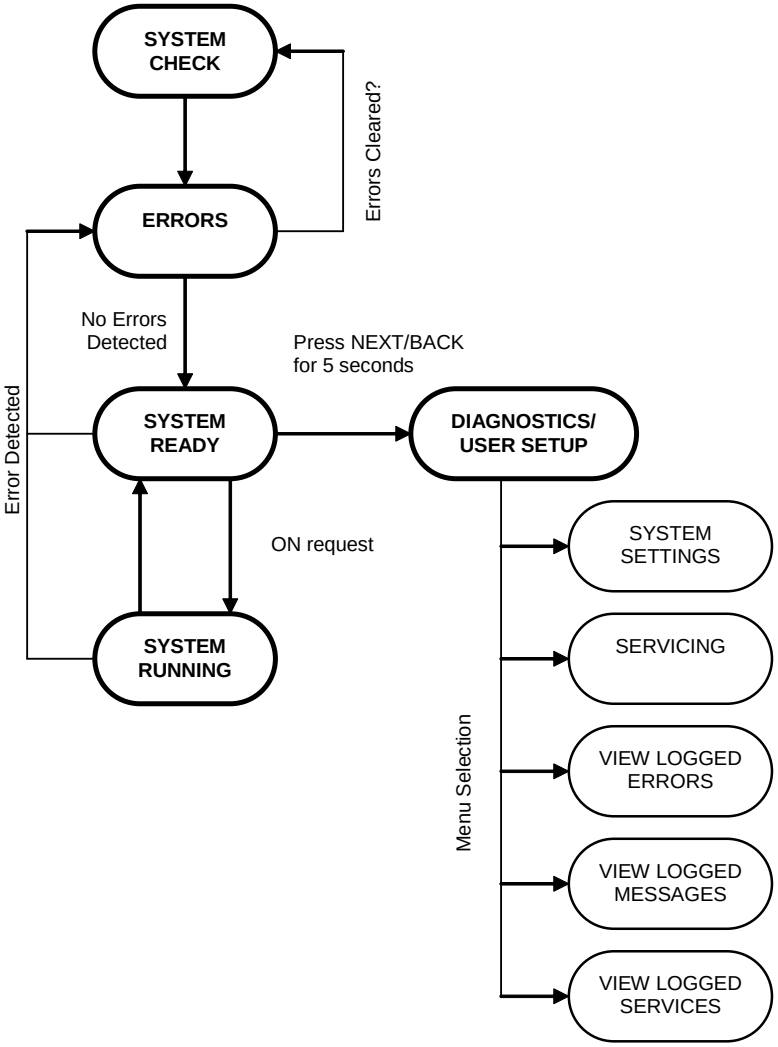


Figure 7 – Display Box Flow Diagram

7.4.1 System Check Menu

Ensure the pneumatic equipment is securely connected and turned off.

To power the control box and display box, turn the key switch from the OFF position to the RUN position.

Once powered, a system check is performed.

During the system check, both the WARNING and READY LEDs remain illuminated and 'SYSTEM CHECK' is displayed.

If any errors are present the WARNING LED will flash on & off, the display will enter the ERRORS menu.

If no errors are present the system will go to SYSTEM READY menu.

7.4.2 System Ready Menu

If any messages are present, the WARNING LED will flash on & off and the messages displayed. The unit will run as normal when messages are present.
If no messages are present, both the READY and WARNING LEDs will be off.

The SYSTEM READY menu will change between the following screens, SYSTEM READY, VMAC PH# 250 740 3200, VMAC WWW.VMACAIR.COM, HOUR METER xxxx.x

Pressing ENTER will initiate the start sequence (see Control System Operation). Once parameters are in the operating range the SYSTEM RUNNING menu is entered.

Pressing and holding both the BACK and NEXT buttons for approx. 5 seconds will bring up the USER SETUP menu.

7.4.3 System Running Menu

If any messages are present, the WARNING LED will flash on & off, the READY LED will remain on, and the messages will cycle on the display.

If no messages are present, the display will cycle through the SYSTEM RUNNING*, AIR PRESSURE, and TIME TO UNLOAD (* or current control state see Control System Operation).

Pressing the NEXT or BACK buttons in SYSTEM RUNNING menu will take the user to the additional information menu where specific information about the RAPTAIR60 sensors are displayed.

Pressing the ENTER or EXIT button will initiate the stopping sequence.

7.4.4 Stopping Sequence

To stop the RAPTAIR60 unit the user can press the ENTER button at any point during operation. The user may also turn the key switch from the RUN position to the OFF position.

7.4.5 Additional Information Menu

The additional information menu for the display box allows the user to monitor specific information about the RAPTAIR60 unit. The parameters displayed are: air pressure, air rate, engine speed, engine temperature, compressor temperature, time to unload (or standby), and hour meter.

The user can scroll through the screens by pressing the BACK and NEXT buttons.

Pressing the EXIT button will return the display box to SYSTEM RUNNING menu.

The display box will return to the SYSTEM RUNNING menu after three minutes of no buttons being pressed by default.

Pressing the ENTER button will initiate the stopping sequence (see Control System Operation)

7.4.6 User Setup Menu

Details on adjustable parameters are summarized in section 7.7.

User setup menu can only be reached from the SYSTEM READY menu by holding both the BACK and NEXT buttons for five seconds. This menu allows the user to define parameters of system operation. User defined parameters include system pressure, unload delay, standby delay, system pressure, top-up pressure, high air rate, restart pressure, allow cold engine restart and disable auto engine restart (for more information on these parameters see Control Systems Operation). User may also reset the unit to factory settings from this menu.

Upon entering this menu the user will see information on how to navigate USER SETUP. Specifically the following:

- To scroll through the menu screens press BACK and NEXT.
- To enter or exit a menu screen press the ENTER or EXIT buttons respectively.

The user will then see USER SETUP on the display module

- Press ENTER to see the parameter screens
- To return to SYSTEM READY menu press EXIT

The first user defined parameter is SYSTEM PRESSURE.

The second user defined parameter is UNLOAD DELAY which can be set as 1 minute, 5 minutes, 10 minutes, 15 minutes, 30 minutes or never.

The third user defined parameter is STANDBY DELAY. The STANDBY DELAY begins after the UNLOAD DELAY has expired. For example if UNLOAD DELAY is set to 5 minutes and STANDBY DELAY to 1 minute, it will take 6 minutes the RAPTAIR60 to go from RUNNING to STANDBY.

Next is TOP-UP PSI, a value below system pressure used to keep tank pressure close to system pressure. If pressure goes below system pressure minus top-up the inlet will open and fill to system pressure (engine RPM will not change).

The next user defined parameter is HIGH AIR RATE, which can be set from –0.5 PSI/Sec to –30 PSI/Sec with 0.5 PSI/Sec increments.

The next parameter is Restart Pressure used to restart the system when pressure has gone below the set value.

The next parameter is Cold Engine Restart, which will allow the engine to restart if temperature has dropped below a preset value.

The next parameter is Disable Auto Restart, which will disable the engine from restarting after an adjustable time.

The next parameter screen in the USER SETUP menu screen is the FACTORY RESET.

- Pressing ENTER on this screen will display CANCEL
- Pressing NEXT will show CONFIRM RESET? Pressing BACK will display CANCEL again
- Select the desired option and press the ENTER button

The END OF USER SETUP screen informs the user there are no more user defined parameters

- Pressing EXIT, NEXT or ENTER will bring the user to USER SETUP SCREEN
- Pressing BACK will bring the user to the first user defined parameter (SYSTEM PRESSURE)

7.5 Automatic Shutdown and Restart

When an error is detected, the controls will automatically shutdown the system, show and log the error that caused the issue.

Also, the system will shutdown if no air use is detected, and it has idled for a preset amount of time. The system can be restarted by using a large amount of air for a short time (air rate) or dropping of air pressure below an adjustable value.

The LED beacon module will illuminate when the RAPTAIR60 is in STANDBY mode and is able to restart when air-use is detected.

The buzzer module will enable and alert the operator before the engine starts.

7.6 Checking Messages and Errors

7.6.1 Errors

If an error is present, the RAPTAIR60 unit *WILL NOT* start the compressor until the error is cleared. When an error is present the WARNING LED will flash on/off and the screen will display 'ERRORS DETECTED' followed by the following list of errors. The user MUST scroll through ALL the displayed errors by pressing the NEXT button before the unit can re-try the start sequence.

ERROR MESSAGE TABLE

Error Code	Error Message Displayed	Cause
5	COMP TEMP SENSOR FAILED – OPEN	Temperature sensor on the compressor is unplugged or wire to control box has been cut.
6	COMP TEMP SENSOR FAILED – SHORT	Temperature sensor on the compressor is shorted.
7	COMP TOO COLD xx.x°F/xx.x°C	Compressor is too cold to start. The temperature is displayed.
8	COMP OVER TEMP xx.x°F/xx.x°C	Compressor is too hot to start. The temperature is displayed.
9	MANIFOLD TEMP FAILED – OPEN	Temperature sensor on the manifold is unplugged or wire to control box has been cut.
10	MANIFOLD TEMP FAILED – SHORT	Temperature sensor on the manifold is shorted.
11	MANIFOLD ERROR CHECK COALESCER	The coalescer should be checked. There is a possibility of a plug.
12	AIR PRESS SIGNAL VOLTAGE LOW	Low voltage reading on the air pressure transducer.
13	AIR PRESS SIGNAL VOLTAGE HIGH	Over voltage reading on the air pressure transducer.
14	AIR PRESS SENSOR TOO HIGH	Air pressure is too high to start the engine.
	AIR PRESSURE xxx.x PSI	If the previous error is present the air pressure is displayed.
34	ENGINE RPM NOT DETECTED	Engine RPM is not detected. Wire may be cut.
35	ENGINE CRANK TIME OUT	The engine did not start during the crank cycle.
36	ENGINE OIL LOW	Oil level in the diesel engine is low.
37	ENGINE TEMP PROBE OPEN	Temperature sensor on the diesel engine is unplugged or wire to control box has been cut.
38	ENGINE TEMP PROBE SHORT	Temperature sensor on the diesel engine is shorted.
39	ENGINE TEMP TOO COLD TO START	The diesel engine is too cold to start.
40	ENGINE OVER TEMP	The diesel engine is too hot to start.
41	SERVICE PANEL OPEN	The service panel is open. It must be closed before the unit is run.
42	FUEL LEVEL LOW PLEASE RE-FILL	Fuel level for the diesel engine is low. It must be re-filled before the unit is run.
27	UNEXPECTED ENGINE OPERATION	Unexpected engine operation can have many causes. It is likely due to RPM detected during an OFF state.
-	DISPLAY CANBUS CONN ERROR	A CAN bus error between the Display box and Control box.
-	End of Errors OK to Retry?	End of errors screen. Pressing ENTER will try to restart the system.

7.6.2 Warning Messages

Listed below are additional messages, which may be displayed. If a message is present, the red WARNING LED will flash on and off. These messages appear in both the SYSTEM READY and SYSTEM RUNNING menus.

WARNING MESSAGE TABLE		
Error Code	**Message Displayed**	**Cause**
29	AIR FILTER PLUGGED	Air filter is not working, or working incorrectly.
32	BATTERY VOLTAGE TOO LOW	The battery voltage is too low.
46	ENGINE RESTART DUE TO COLD	The engine has auto restarted due to the low internal temperature.
-	500HR/6MTH SERV DUE IN xx HOURS	This warning will show up 10 hours before the 500 hour service internal.
54	COMPRESSOR SERV 500HR/6MTH	The system is due for a service. This warning will show after every 500 hours of running the compressor. Clearing the compressor service reminder is required through the Diagnostic menu.
	1000HR/12MTH SER DUE IN xx HOURS	This warning will show up 10 hours before the 1000 hour service internal.
55	COMPRESSOR SERV 1000HR/12MTH	The system is due for a service. This warning will show after every 1000 hours of running the compressor Clearing the compressor service reminder is required through the Diagnostic menu.
-	ENGINE SERVICE 50 HOURS	Engine servicing required. See Section 8.6
-	ENGINE SERVICE 100 HRS/ENG. OIL	100 hour engine servicing required. See Section 8.6
-	ENGINE SERVICE 200 HRS/OIL+FILT	200 hour engine servicing required. See Section 8.6

7.7 Adjusting System Parameters

See section 7.4.6 for adjusting settings.
Below is a table of the adjustable settings accessible though the display box diagnostics section.

SYSTEM PARAMETER TABLE			
Setting	**Description**	**Adjustment**	**Default**
Unload Delay	Delay time to unload	1, 2, 5, 10, 15, 30 minutes, Never	2 min
Standby Delay	Delay time to standby	1, 2, 5, 10, 15, 30 minutes, Never	5 min
System Pressure	Operating System Pressure	80 to 150PSI @ 5PSI increments	150PSI
Top-up Pressure	PSI below system pressure to allow inlet to open and build pressure	1 to 10PSI @ 1PSI increments	5PSI
High Air Use Rate	Air rate set-point for pressure-based restart condition	0 to -30PSI @ 0.5PSI increments	-3.0PSI/sec
Pressure Restart PSI	Air pressure set-point for pressure-based restart	80 to 150PSI @ 5PSI increments	120PSI
Allow Cold Engine Restart	Allow to restart the engine if engine is beginning to freeze	Enable/Disable	Enabled
Disable Auto Restart Delay	Timer for disabling automatic engine restart	Always, 30 min, 60 min, 120 min, Never	30 min

7.8 Cold Weather Operation

If the cold weather kit for the RAPTAIR60 is installed, plug in the kit as per section 4.5 to warm the engine and the compressor before operating.

Press the ON/ENTER button or turn the key to the START position. The Display box will display GLOW PLUG mode on the screen and delay starting the engine from 1 to 15 seconds, depending on the engine temperature. After this delay, the engine should start and run.

The control system will go into WARMING mode, monitoring the engine temperature and compressor temperature. Once both temperatures have warmed to a preset level, the system will enter RUNNING mode and build to full system pressure.

8.0 Routine Maintenance

Maintenance is a planned program, which provides an orderly series of service and inspection procedures, together with cleaning. A well-planned maintenance program lowers maintenance costs, reduces down time and can prevent possible accidents due to failed components.

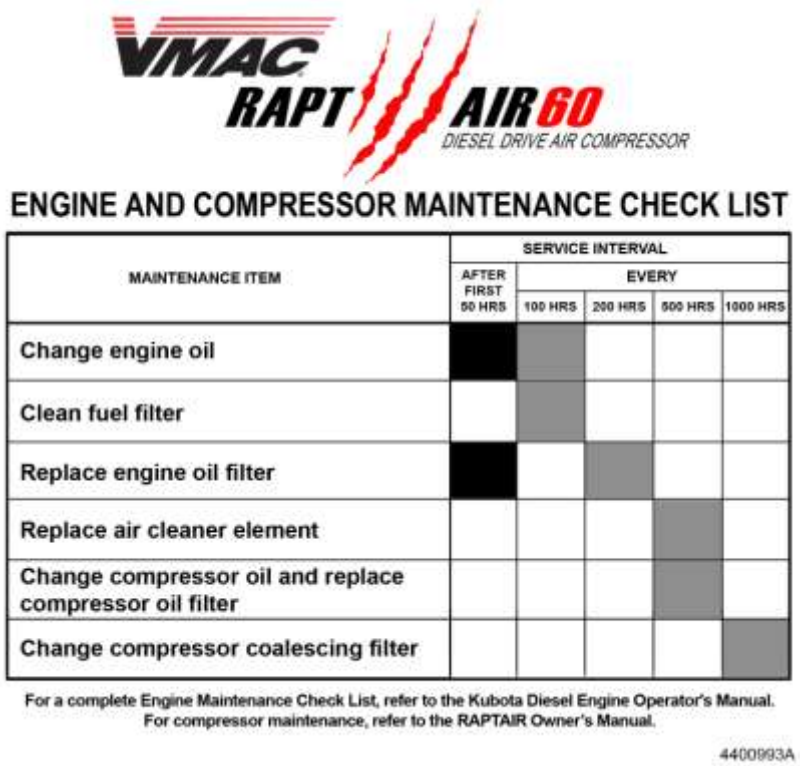


Figure 8 – Engine and Compressor maintenance check list

Shut down the RAPTAIR60 Compressor for 5 minutes. After 5 minutes discharge all air to ensure the system is fully depressurized.

Torque Specifications

STANDARD GRADE 8 NATIONAL COARSE THREAD								
Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	¾
Foot-pounds (ft-lb)	9	18	35	55	80	110	170	280
Newton meter (N•m)	12	24	47	74	108	149	230	379

STANDARD GRADE 8 NATIONAL FINE THREAD					
Size	3/8	7/16	1/2	5/8	¾
Foot-pounds (ft-lb)	40	60	90	180	320
Newton meter (N•m)	54	81	122	244	434

METRIC CLASS 10.9					
Size	M8	M10	M12	M14	M16
Foot-pounds (ft-lb)	19	41	69	104	174
Newton meter (N•m)	25	55	93	141	236

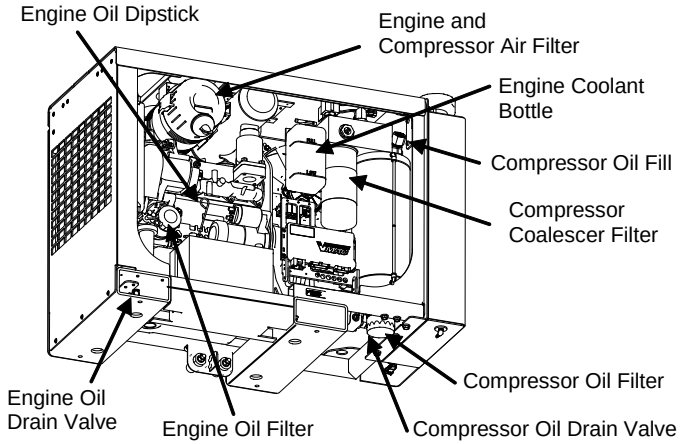


Figure 9 –Oil and Air filter Service Locations

8.1 Compressor Servicing and Maintenance Schedule

The following maintenance schedule should be adhered to, to assure good performance and long service life. The hours indicated are those displayed on the compressor hour meter. Service should be performed at the lesser of the two intervals, whichever occurs first.

Check the Illustrated Parts List for replacement part numbers or call VMAC.

Every time before start up

- Check the level of oil in the air/oil separator tank
- Check air supply lines are in good working order
- Check compressor and hoses for damage or wear
- Check after cooler drain collection bottle (if equipped)

Every 500 hours or 6 months as shown on the Display Box
(More frequently if used in dusty or extreme working conditions)

- Change compressor oil
- Change compressor oil filter
- Change compressor air filter

Every 1000 hours or 12 months as shown on the Display Box

- Perform items in the 500 hour / 6 month service and
- Change coalescing filter

Extreme Environmental Service Intervals
Change the following items as per intervals specified

- Heavy duty air filter = 250 hrs
- Compressor Oil = 250 hrs
- Oil Filter = 250 hrs
- Coalescing Filter = 250 hrs

NOTE ***VMAC certified synthetic oil should be used. Failure to use this oil or other recommended alternatives may result in damage to the compressor and may void the warranty.***

8.2 Checking and Adding Compressor Oil

8.2.1 Check oil level in air/oil separator tank

The air compressor system holds 4 litres of oil, which includes enough to fill the oil filter. The filter holds 0.3 litres of oil. The compressor holds about 0.5 litres of oil.

☐ Check the level the oil has reached on the oil level sight tube.

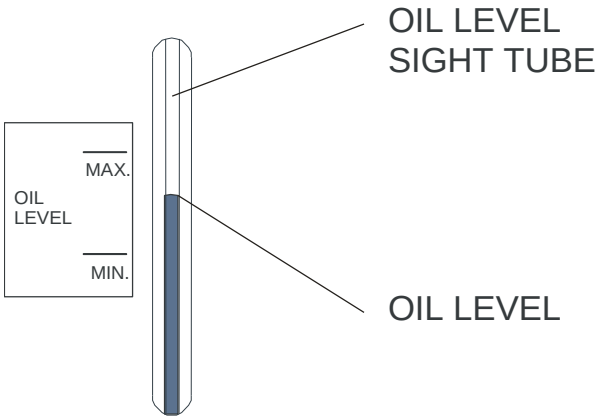


Figure 10 – Checking Compressor Oil Level

- ☐ Use a funnel inserted into the oil fill port in the air/oil separator manifold and pour in VMAC certified or approved synthetic oil.
- ☐ Replace the cap on the oil fill port and tighten.
- ☐ Start the system following the start-up procedure in section 7.3.1.
- ☐ Allow the system to pressurize.
- ☐ Turn off the system using the shutdown procedure in section 7.3.2.
- ☐ Wait 5 minutes then drain the air fully to depressurize the system.
- ☐ Check for oil leaks.
- ☐ Repeat until the oil level sight tube shows the oil level in the air/oil separator tank is in the operational range.

8.3 Replacing the Air Filter

Follow all safety precautions. For ease of service the air filter is located just under the roof of the RAPTAIR60 behind the service panel. The filter is also equipped with a filter minder switch at the back, and is monitored by the control system.

- ☐ Clean loose dust and debris from the area around the filter cover to prevent contaminants from entering the system.
- ☐ Remove the air filter cover retaining clamps and the cover.
- ☐ Immediately cover the air intake with a clean cloth to prevent contamination entering the intake hose and compressor.

NOTE ***Do not use compressed air or perform any other tasks around the filter and cover until both are replaced. Never clean the filter element with compressed air, as this will allow some contaminates into the compressor system. Always replace the air filter element.***

- ☐ Remove the filter element from the filter cover. Clean the inside of the cover with a clean, dry cloth.

Do not use flammable solvents to clean the inside of the cover. If a solvent has been used rinse the cover thoroughly with water and dry it before installing the cover. Fire in the compressor can cause an explosion.

- ☐ Remove the cloth from the compressor air intake.
- ☐ Place the filter into the cover and secure it with the cover nut/ clamps.

8.4 Replacing Compressor Oil and Filter

8.4.1 Changing Compressor Oil

Follow all safety precautions.

☐ Clean debris and dust from the area around the drain valve of the air/oil separator tank to prevent contamination.

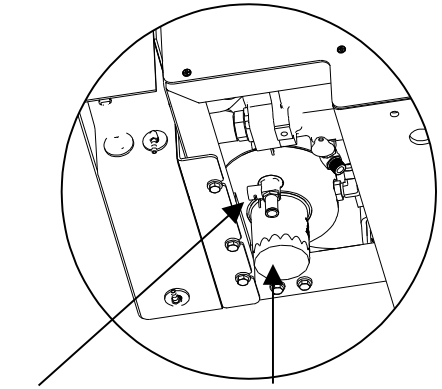


Figure 11 - Oil Filter Location

☐ Insert a hose over the air/oil separator tank's drain valve outlet and open the valve to drain the oil into a container large enough to hold at least 1-1/2 US Gallons (6 liters). After the oil has drained, close the valve.

NOTE ***Dispose of the oil in accordance with the Environmental Protection Laws in your location.***

☐ Remove and replace the oil filter at this time following section 8.4.2.

☐ Clean debris and dust from the area around the oil fill port of the air/oil separator manifold to prevent contamination.

NOTE ***4 liters of VMAC certified or approved synthetic oil is required to fill the system.***

☐ Unscrew and remove the oil fill port cap. Use a funnel inserted into the port and pour in the required amount of VMAC oil.

☐ Follow the oil level checking procedure in Section 8.2.1.

8.4.2 Changing Compressor Oil Filter

Follow all safety precautions.

☐ Clean debris and dust from the area around the air/oil separator tank and the filter to prevent contamination.

☐ Remove the filter by turning it counterclockwise using a suitable filter wrench.

Check the filter to make sure that the threaded nipple did not unscrew with the filter. If it is in the filter, remove it carefully to avoid thread damage, coat the threads that go into Separator Tank Base with a small amount of Loctite blue and install it into the Tank base.

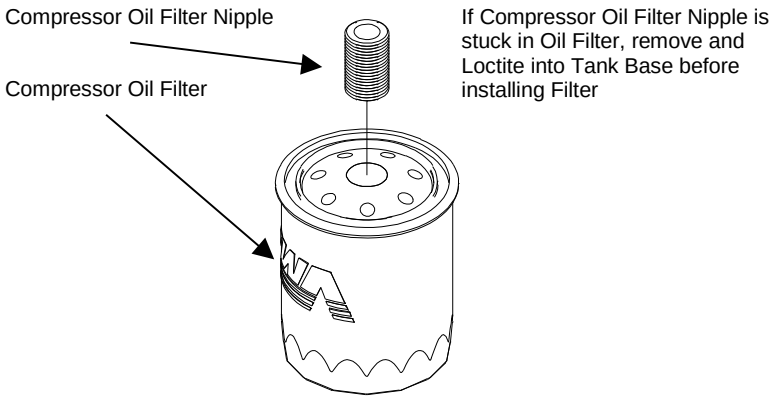

Compressor Oil Filter Nipple
Compressor Oil Filter
If Compressor Oil Filter Nipple is stuck in Oil Filter, remove and Loctite into Tank Base before installing Filter

Figure 12 – Compressor Oil Filter

☐ Check the gasket-sealing surface of the air/oil separator tank for contamination, old gasket material or damage.

Make sure the new filter is a VMAC filter, part number 9200039. This oil filter is a high pressure oil filter, not an automotive oil filter, which will rupture under high pressure.

☐ Apply a thin coating of compressor oil to the filter sealing gasket.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface of the air/oil separator tank.

☐ Tighten the filter an additional 3/4 to 1 turn to seat the sealing gasket.

Never over-tighten the filter, as this may damage the seal or filter.

☐ Follow the oil level checking procedure in Section 8.2.1.

8.5 Replacing the Coalescing Filter

Follow all safety precautions.

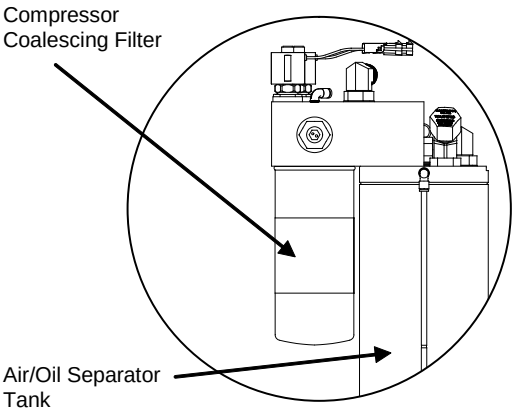


Figure 13 - Coalescing Filter Location

Do not use a screwdriver punched into the side of the filter, as this practice can damage the scavenging tube and screen. See Fig. 12.

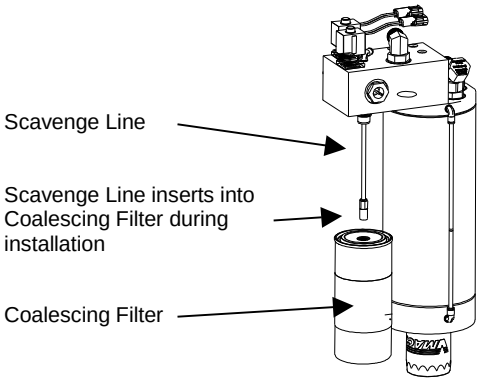


Figure 14 – Avoid Damaging the Scavenge Line

Check the filter to make sure that the threaded nipple did not unscrew with the filter. If it is in the filter, remove it carefully to avoid thread damage, coat the threads that go into manifold block with a small amount of Loctite blue and install it into the manifold block. Use caution when removing the filter so as to avoid catching the scavenge screen orifice on the bottom of the scavenge tube on the lip of the coalescing filter. This scavenge screen orifice is attached to the scavenge tube by a "push to connect" fitting, if the fitting has come off of the tube re-insert the tube into the fitting ensuring that the tube is fully engaged.

☐ Check the gasket-sealing surface of the manifold block for contamination, old gasket material or damage.

Make sure the new filter is a VMAC filter, part # 3600079. This is a high-pressure filter. Use of other filters not rated to the required pressure may cause the filter to rupture.

☐ Apply a thin coating of compressor oil to the coalescing filter sealing gasket and coat the end of the threaded nipple, as there is also an O-ring inside the coalescing filter.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface of the manifold block.

☐ Tighten the filter an additional 3/4 to 1 turn to seat the sealing gasket.

Never over-tighten the filter, as this may damage the seal or filter.

☐ Check the oil level following the oil level checking procedure in Section 8.2.1.

8.6 Engine Maintenance

Refer to the Kubota Engine manual supplied with the RAPTAIR60. (VMAC p/n: 1900919).

After first 50 hours
- Change engine oil
- Replace engine oil filter

Every 100 hours
- Change engine oil
- Clean fuel filter

Every 200 hours
- Change engine oil
- Clean fuel filter
- Replace engine oil filter

The Display Box will inform the operator when engine and compressor servicing is due. Refer to Section 7.6.2 for the Display box servicing message list.

Engine service reminders do not need to be cleared in the Display Box. Reminders will show 10 hours before and 10 hours after the engine service intervals.

8.6.1 Draining Engine Oil

☐ Locate the drain port inside the rectangular tube below the radiator and behind the front service panel (Fig. 13).

☐ Insert a hose over the drain valve outlet and open the valve to drain the oil into a container large enough to hold at least 1-1/2 US Gallons (6 liters). After the oil has drained, close the valve.

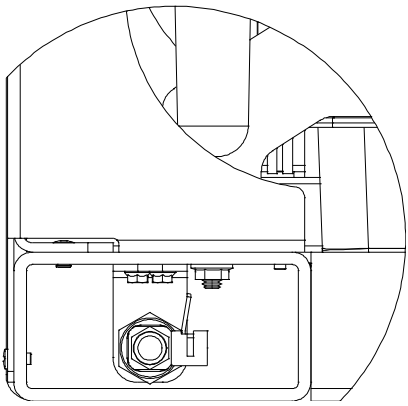


Figure 15– Engine Oil Drain Valve

8.6.2 Adding Engine Oil

☐ Oil can be added using an accordion funnel with the engine's fill cap on the top of the engine. If an appropriate funnel is not available, the oil can be added using the dipstick port above the battery.

8.7 Electrical Component and Relay Locations

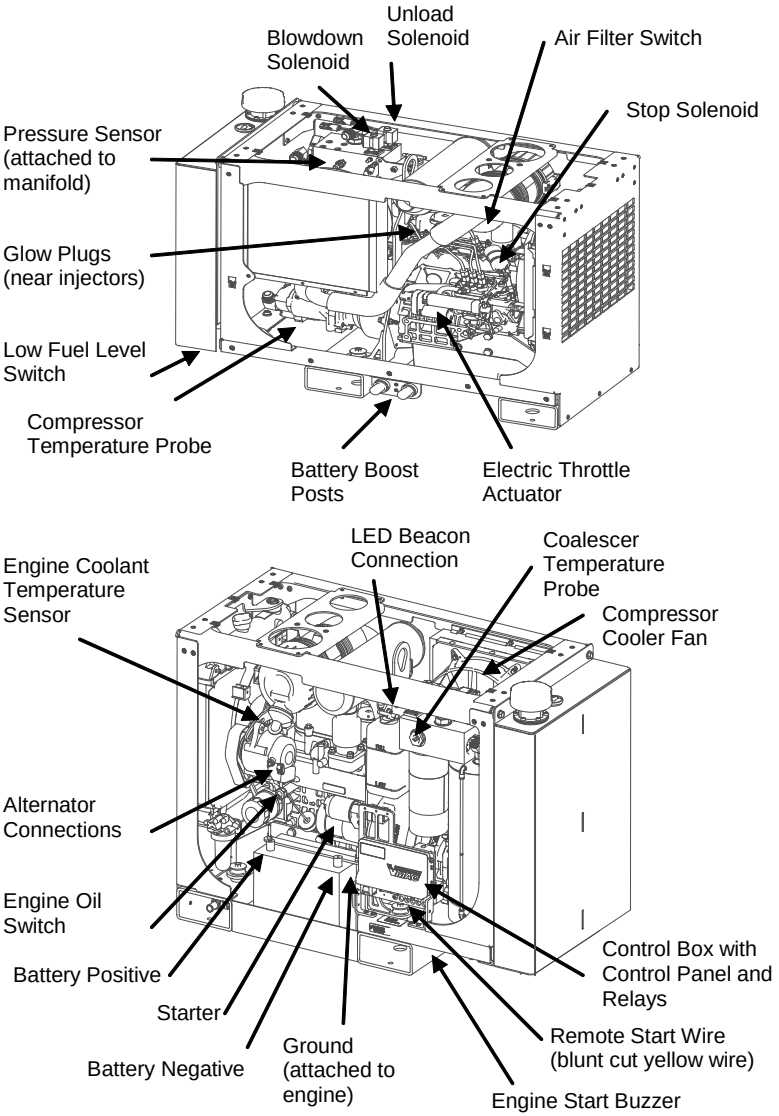
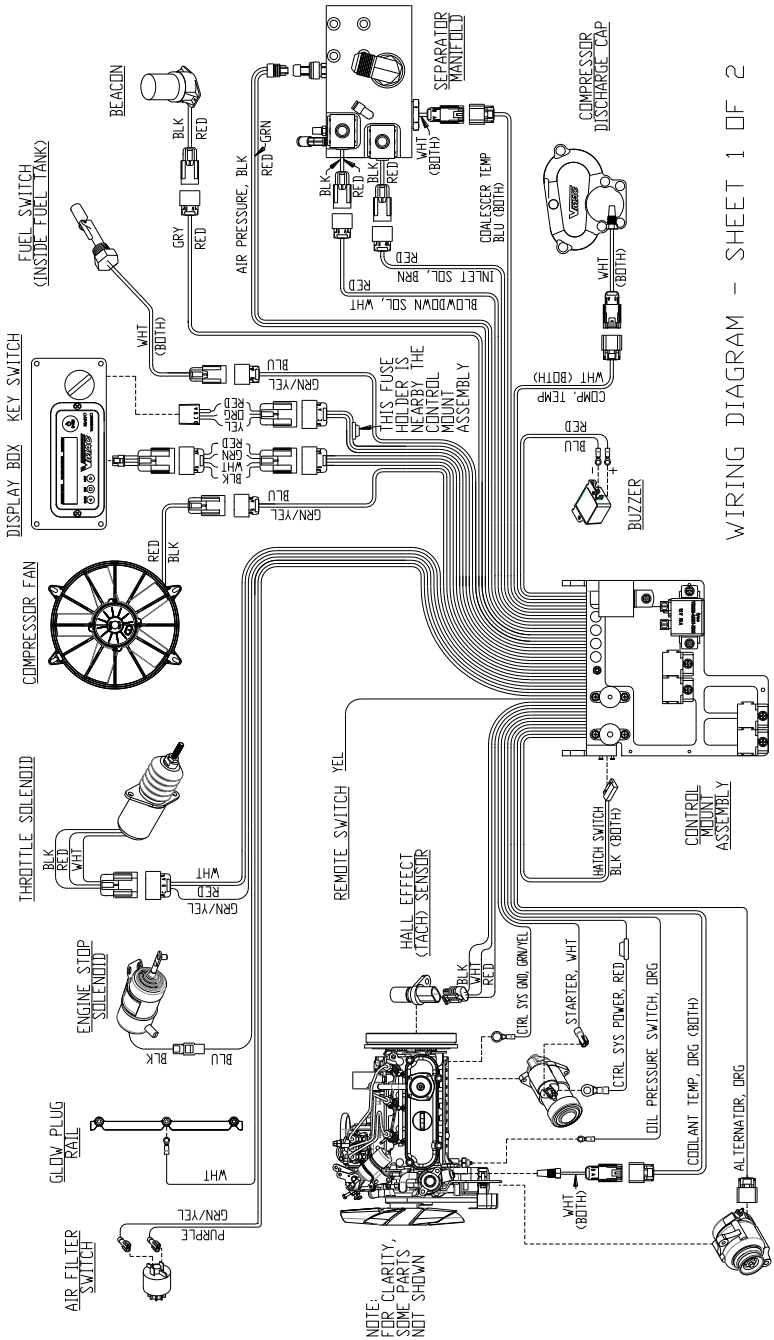
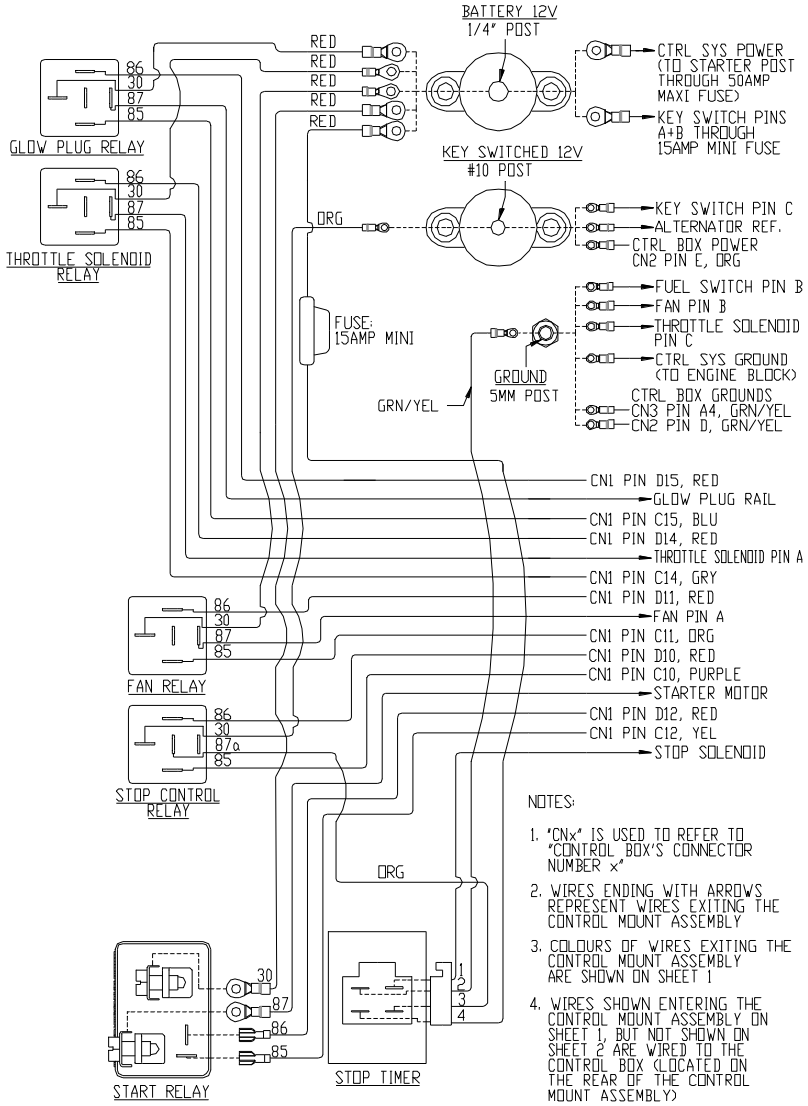


Figure 16 – Electrical Component Locations



VMAC – ***Vehicle Mounted Air Compressors***
Toll Free: 1-800-738-8622 Local: 1-250-740-3200
Fax: 1-250-740-3201



WIRING DIAGRAM - SHEET 2 OF 2

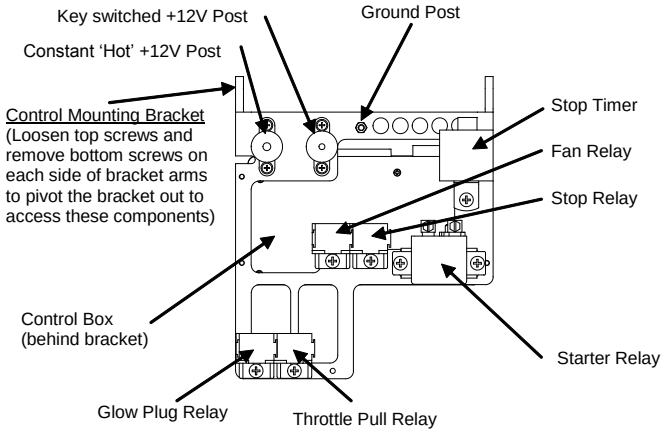

Key switched +12V Post
Ground Post
Constant 'Hot' +12V Post
Control Mounting Bracket
(Loosen top screws and remove bottom screws on each side of bracket arms to pivot the bracket out to access these components)
Stop Timer
Fan Relay
Stop Relay
Control Box
(behind bracket)
Starter Relay
Glow Plug Relay
Throttle Pull Relay

Figure 17 - Control Mount Assembly

To gain access to the relays, the control panel is able to swivel down. Unscrew the lower bolt on each side on the control panel and swing the unit down.

8.8 Clearing Service Reminders

Perform appropriate compressor servicing as per section 8.0. Engine servicing reminders do not need to be cleared.

☐ Turn the key switch to the RUN position, do not start the unit.

☐ Enter Diagnostics mode in the Display Box by holding the NEXT and BACK button for 5 seconds.

☐ Use the NEXT button to scroll to the Servicing section. Press ENTER to the Servicing section. Press ENTER to confirm servicing is completed.

The system will only allow services to be logged when approaching the 500 hour or 1000 hour service reminder time. The Display Box shows running time in (hours).(1/10th hour).

9.0 Troubleshooting

Problem diagnosis for the compressor system should follow sound, recognized practice. Quick, accurate diagnosis of problems is possible by;

- ☐ Accurately identifying the problem by operating the system yourself, following safety practices
- ☐ Determining possible causes for the problem by understanding how the system operates
- ☐ Isolating the potential causes by accurate testing using the correct, recognized procedures
- ☐ Performing proper repairs using the correct procedures outlined in this manual and the recommended replacements parts
- ☐ Performing proper post-repair testing to ensure that the repairs were effective

When performing problem diagnostics, do not use test practices that are potentially harmful to the people involved, or the equipment.

Electrical testing should be performed according to the processes described in the troubleshooting charts and in conjunction with the manuals provided by VMAC.

Troubleshooting Table		
SYMPTOM	**POSSIBLE CAUSE**	**CORRECTIVE ACTION**
Frequent relief valve operation	Pressure control line plugged or frozen	Remove and clear the line
	System still at high pressure	Wait for system blow-down or bleed off all system pressure
	Defective relief valve	Replace the valve
Compressor does not run	High system pressure	system will not start with more than 10 psi system pressure
	High oil temperature	See “frequent over-temperature shut-down”
Frequent over-temperature shut-down	Low oil level	Check oil level with equipment on level ground
	Restricted oil lines	Check for kinked or pinched lines
	Plugged oil filter	Replace oil filter
	Cooler not functioning or plugged	Replace or clean oil cooler
	Engine cooling system failure (high engine temperature)	Correct problem
	High ambient temperatures	Reduce duty cycle
	Oil temperature sensor failure	Replace if defective
Excessive oil in the air	Coalescing separator failure	Replace element
	Clogged scavenge line screen	Clean or replace
	High oil level	Check oil level with equipment on level ground
	Operating angle in excess of 15 degrees from horizontal	Reduce operating angle
	Air operated equipment is faulty, or not correctly connected to supply valve	Test air operated equipment for proper operation and connect to supply valve
	Incorrect start-up/ shutdown procedures	Observe start-up/ shutdown procedures detailed in this manual.
Objectionable noise level	Excessive gear wear	Replace gearbox assembly

10.0 Warranty

10.1 Maintenance and Repair Records

System Installation

System ID number: _____

Compressor Serial Number: _____

System Installed by: _____

Address: _____

_____

Date Installed: _____

50 Hour Inspection

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced: _____

or notes: _____

500 Hour or 6 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

1000 Hour or 12 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

1500 Hour or 18 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

2000 Hour or 24 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

10.2 Part Replacement or Adjustment Record

Record #1

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #2

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #3

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #4

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #5

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #6

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #7

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #8

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

10.3 VMAC Warranty

1 GENERAL PROVISIONS AND LIMITATIONS

1.1 VMAC, Division of Mangonel Investments Corporation, (hereafter ”VMAC”) warrants to each original retail purchaser (hereafter “Buyer”) of its new RAPTAIR60 Systems (hereafter “Product(s)”) from VMAC or its authorized Dealers that such Product(s) are, at the time of delivery to the Buyer, free of manufacturer defects in material and workmanship.

1.2 See Kubota manual for engine warranty.

2 NO WARRANTY IS MADE WITH RESPECT TO

2.1 Any Product(s) which have, in VMAC’s judgment, been subject to negligence, accident or improper storage, installation, application, operation or maintenance, or have been repaired or altered in such a way that affects the Product(s) adversely.

2.2 Components or accessories manufactured, warranted and serviced by others.

2.3 Damages caused from normal maintenance service and repairs and corrections with minimum action, such as adjustments and inspections, or replacement of items, such as service filters, belts, seals and service kits.

2.4 Consequential damages caused by Product(s) failure.

2.5 Any Product(s) if other than VMAC’s genuine components are used in the Product(s).

2.6 Normal wear and tear of Product(s).

3 WARRANTY PERIOD

3.1 The warranty period will commence upon installation of the Product(s). The returned warranty registration form marks the date of installation. If the warranty registration form has not been received by VMAC within 6 months from the date of installation of the Product(s), then the warranty period will be deemed to commence 30 days from date of shipment from VMAC. For the full warranty period to apply, installation of Product(s) must be completed within 36 months from the date of shipment of the Product(s) from VMAC.

3.2 The following components of Product(s) are warranted against manufacturer defects in materials and workmanship for a period of 24 months or 2,000 hours of operation, whichever expires first: Compressor, Brackets, Air/Oil Separator Tank and Oil Cooler.

3.3 All other components of Product(s), not listed in 3.2, are warranted against manufacturer defects in materials and workmanship for a period of 12 months or 1,000 hours of operation, whichever expires first.

3.4 Replacement components of Product(s) listed in 3.2, excluding VMAC factory rebuilt components, shall be warranted for the remainder of the original warranty period. If the original warranty period has expired, replacement components of Product(s) listed in 3.2 and purchased by Buyer, excluding VMAC factory rebuilt components, shall be warranted for a period of 12 months or 1,000 hours of operation, whichever expires first.

3.5 VMAC factory rebuilt components shall be warranted for a period of 6 months from date of shipment from VMAC.

3.6 Replacement components of Product(s) listed in 3.3, shall be warranted for the remainder of the original warranty period. If the original warranty period has expired, replacement components of Product(s) listed in 3.3 and purchased by Buyer, shall be warranted for a period of 12 months or 1,000 hours of operation, whichever expires first.

4 VMAC OBLIGATIONS

4.1 VMAC's obligation is limited to repairing or, at VMAC's option, replacing, during normal business hours at an authorized service facility of VMAC, any component, which in VMAC's judgment is proven to be defective as warranted.

4.2 VMAC's obligation is limited to Product(s) proven to be warranted. No liability is accepted for any consequential damages, injuries or expenses directly or indirectly related to Product(s) failure.

5. BUYER OBLIGATIONS

5.1 Buyer shall notify VMAC of the alleged defect within 10 days of initial discovery and return the allegedly defective component(s) within 30 days of initial discovery.

5.2 The Buyer must prepay all costs associated with the warranty claim and submit receipts and/or invoices to VMAC for evaluation.

5.3 If required by VMAC, the Buyer must return components claimed under this warranty to a facility designated by VMAC for evaluation, to establish a claim under this warranty.

5.4 Buyer shall maintain and service VMAC Product(s) in accordance with the VMAC Product(s) Owner's Manual.

6. WARRANTY REGISTRATION VALIDATION

6.1 A warranty registration form is provided to the Buyer with the Product(s). The form must be fully completed by the Buyer and returned to VMAC upon completion of the installation of the Product(s) to validate the warranty. Warranty registration can also be completed online on the VMAC website at http://www.vmac.ca/index.php?warrantyregistration. Warranty claims will not be processed unless VMAC has received a fully completed warranty registration form.

7. DISCLAIMER AND WARRANTY SERVICE

7.1 Any labor costs claimed in excess of VMAC's set rate and/or times are not provided by this warranty. If applicable, any labor costs in excess of VMAC rate schedules caused by, but not limited to, location or inaccessibility of the equipment, travel time or labor provided by unauthorized service personnel are not provided by this warranty.

7.2 This warranty is in lieu of all other warranties or obligations, express or implied. VMAC expressly disclaims all implied warranties of merchantability or fitness for a particular purpose.

7.3 Warranty claims must be pre-authorized by VMAC, and the components returned via prepaid freight using the designated "Returned Merchandise Authorization" number and form.